

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

**ECE2056 – DATA COMMUNICATIONS AND
NETWORKING**

(All sections)

28 MAY 2019
9.00 A.M. – 11.00 A.M.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of 5 printed pages with 4 questions only.
2. Answer **ALL** the 4 questions. The distribution of marks for each question is given.
3. Please print all your answers in the Answer Booklet provided.

Question 1 (25 marks)

- (a) The Transmission Control Protocol/Internet Protocol (TCP/IP) model is the dominant commercial architecture for data communications and networking.
- (i) Discuss the functions and protocols of the datalink, transport and network layers.
[6 marks]
 - (ii) With the aid of a diagram, describe how the encapsulation process is done for the layers discussed in (a) (i).
[6 marks]
- (b) Discuss the advantages of virtual circuit networks.
[4 marks]
- (c) The Point-to-Point (PPP) protocol is widely used for data transfer control and management in point-to-point access.
- (i) Describe the phases of the PPP protocol.
[5 marks]
 - (ii) With the aid of a diagram, discuss the mechanism of the Challenge Handshake Authentication Protocol (CHAP) protocols that resides within the PPP protocol.
[4 marks]

Continued...

Question 2 (25 marks)

- (a) Discuss in detail three methods of *controlled* media access protocols. [9 marks]
- (b) A network uses Carrier Sense multiple Access with Collision Detection (CSMA/CD) as a media access protocol. The channel bandwidth is 15 Mbps, while the signal propagation speed is 2×10^8 m/s. Each frame size is 2000 bits.

The transmission scenario between two stations, Station A and Station B, is shown in **Table Q2(b)** below:

Time	Transmission Scenario
$t = 0$	Station A begins transmitting a frame, FRAME 1
$t = 5 \mu\text{s}$	Station B begins transmitting a frame, FRAME 2
$t = 15 \mu\text{s}$	Station B receives the first bit of FRAME 1

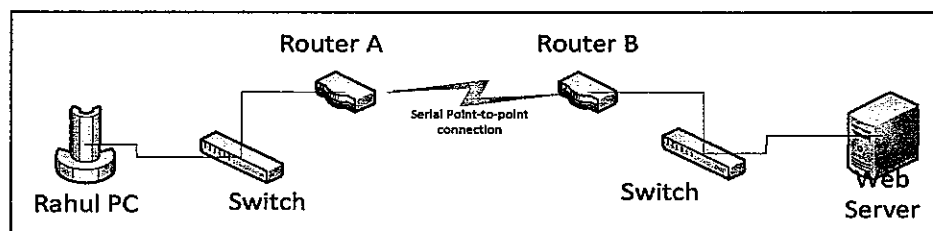
Table Q2(b)

- (i) Calculate the distance between Station A and B. [3 marks]
- (ii) Calculate the time taken to transmit one frame. [3 marks]
- (iii) How many bits will Station A successfully send before it detects a collision? [4 marks]
- (c) A receiver receives an Ethernet frame with the following addresses as the source address. Justify whether the receiver will discard or receive the frame.
- (i) 2A:3F:43:4A:21:93 [2 marks]
- (ii) FF:FF:FF:FF:FF:FF [2 marks]
- (iii) 41:6D:3B:77:30:8E [2 marks]

Continued...

Question 3 (25 marks)

- (a) Define subnet mask. What do the bits in the mask whose values are binary 0 tell you about the corresponding IP address(es).
[2 marks]
- (b) What is subnetting and under what circumstances are subnetting needed?
[4 marks]
- (c) Given the IP address 10.5.118.3 and the mask 255.255.0.0, what is the subnet number? Justify your answer (use the binary of 10.5.118.3 is 0000 1010 0000 0101 0111 0110 0000 0011)
[4 marks]
- (d) Given the IP address 190.1.42.3 and the mask 255.255.255.0, what is the broadcast address? Justify your answer (use the binary of 190.1.42.3 is 1011 1110 0000 0001 0010 1010 0000 0011)
[4 marks]
- (e) Given the IP address 140.1.1.1 and the mask 255.255.255.248, what are the assignable IP address in this subnet? Justify your answer.
[4 marks]
- (f) **Figure Q3(f)** shows the end-to-end network diagram, for Rahul's PC to access the web-server:

**Figure Q3(f)**

Rahul PC is configured with IP address 10.1.1.1, mask 255.255.255.0.
Router A's Ethernet interface is configured with 10.1.1.100, mask 255.255.255.224
Router A's serial interface uses 10.1.1.129, mask 255.255.255.252
Router B's serial interface uses 10.1.1.130, mask 255.255.255.252
Router B's Ethernet interface is configured with 10.1.1.200, mask 255.255.255.224
The web server uses 10.1.1.201, mask 255.255.255.224.

Is anything wrong with this network? Explain and justify your answer.
What is the easiest thing you could do to fix it? (assume any working interior routing protocol)

[7 marks]

Continued...

Question 4 (25 marks)

- (a) User Datagram Protocol (UDP) and Transmission Control Protocol (TCP) are two commonly used Transport layer protocols.
- (i) Describe UDP. [2 marks]
 - (ii) Describe TCP. [2 marks]
 - (iii) When is TCP preferred over UDP and vice-versa? Explain in term of flow, error and congestion control. [4 marks]
 - (iv) List 2 protocols AND an example of an application that uses UDP. [2 marks]
- (b) Assume a Transmission Control Protocol (TCP) client expects to receive byte 2001, but it receives a segment with sequence number 1201. What is the reaction of the TCP client to this event? Explain the reason. [3 marks]
- (c) A packet has arrived in which the offset value is 300 bytes and the payload size is 100 bytes. What are the numbers of the first byte and the last byte, respectively? [3 marks]
- (d) Assume we need to design a Selective-Repeat sliding-window protocol for a network in which the bandwidth is 1Gbps and the average distance between the sender and receiver is 5,000 km. Assume the average packet size is 50,000 bits and the propagation speed in the media is 2×10^8 m. Find the maximum size of the send and receive windows, the number of bits in the sequence number field (m), and an appropriate time-out value for the timer. [7 marks]
- (e) A client uses Transmission Control Protocol (TCP) to send data to a server. The data consist of 16 bytes. Calculate the efficiency of this transmission at the TCP level (ratio of useful bytes to total bytes). [2 marks]

End of paper